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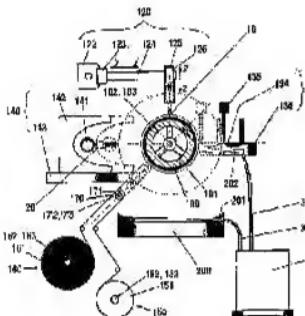
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(54) METHOD AND APPARATUS FOR MANUFACTURING SEAMLESS SLEEVE BODY FOR PRINTING

(57)Abstract:

PROBLEM TO BE SOLVED: To easily manufacture a seamless sleeve body for printing capable of relief image formation by laser direct engraving as a dry method by using liquid photosensitive resin.

SOLUTION: Disclosed are the manufacturing method for the seamless sleeve body for printing which comprises a coating stage of quantitatively supplying the liquid photosensitive resin to the outer circumferential surface of a rotating cylinder an exposure stage of photosetting the applied liquid photosensitive resin while making the coating thickness uniform, and a postprocessing stage for the photoset surface of the seamless sleeve resin body, and an apparatus for easily realizing the manufacturing method.



DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the manufacturing installation for enforcing a manufacturing method of the seamless sleeve object for printing used as a seamless cylinder relief printing which mainly comprises a photopolymer, and a method for the same.

[0002]

[Description of the Prior Art]Like corrugated fiberboard printing and film printing, it had a certain amount of unevenness, or it is widely known as a plate for Toppan Printing represented by the flexographic printing to a smooth surface top that the photosensitive resin printing is used. As liquid photosensitive resin used for the platemaking of the photosensitive resin printing concerned, APR (a brand name, the Asahi Chemical make) is the most typical goods, for example. Although various models are provided corresponding to platemaking size or platemaking capability also as a platemaking apparatus, these are all the platemaking apparatus of the flat-surface exposure system which molds the liquid photosensitive resin concerned planate and makes a relief image form on the one side.

[0003]In the plate making process of this flat-surface exposure system, the image formation finishing negative film obtained from film manufacturing systems, such as an imagesetter, is fixed on planes glass. After making a base film laminate on it further, covering the negative film concerned with a transparent cover film, and applying liquid photosensitive resin by fixed thickness from on the, photo-curing of the photosensitive resin layer is selectively carried out by irradiating with an ultraviolet radiation line from a glass lower part. Uncured resin of a photosensitive resin layer will be in the state where the relief image in which washing removal was carried out with the penetrant remover, and the picture of the negative film was projected on the photosensitive resin layer as a result was formed. It becomes printing implementation, after the relief printing by a photopolymer is obtained through the photochemical tail end process needed and being twisted around the cylinder of a flexographic press next.

[0004]However, in the state where it twisted around the cylinder, the relief printing engraved with such a flat-surface exposure system. Since the joint (seam) which the tip and termination of a printing plate form inevitably exists, to especially printing that needs a continuous design like wallpaper, a fancy paper, and gift packaging paper, it is unsuitable.

[0005]As a plate which can print a continuous design of having no joint (seamless), the vulcanized rubber has been used from the former. It is possible to be able to use rubber with a severe solvent, and it to be supposed for that it has still better ink transfer nature, high elasticity, and high compressibility, to sculpture directly with infrared laser these days, and to obtain a relief printing. The rubber currently used commercially -- a natural product -- or there is a compound. As an example of a synthetic rubber, there is an ethylene-propylene-diene monomer elastomer (EPDM) and the flexographic printing material in which laser engraving is possible can be provided using this. The flexographic printing material manufactured from crude rubber or a synthetic rubber needs vulcanization by sulfur, a sulfur content compound, or a peroxide, in order to perform chemical bridge construction. After being vulcanized in this way, the polish for obtaining uniform thickness suitable for printing and the smooth surface is needed. This requires time remarkably and is also labor-intensive.

[0006]The sheet-shaped photopolymer has also been used as a plate which can, on the other hand, print the continuous design of having no joint (seamless) using a photopolymer. As a means using the sheet-shaped photopolymer concerned, the method and device which manufacture a cylindrical photosensitive member from the photopolymer sheet which is a solid or was fused are shown, for example in JP,9-

169060,A. When it is going to obtain the plate for printing without a joint from a sheet-shaped photopolymer, after twisting a sheet-shaped photosensitive resin printing around a sleeve surface and generally carrying out heating fusion of the joining section, the polishing process for version thickness equalization and smooth-surface-izing is carried out like the case of the above-mentioned rubber. The uniform carbon black layer which does not have a pinhole in a layer part is made to form as substitution of the negative film used with the above-mentioned flat-surface exposure system. Then, ablation removal of the carbon black layer is selectively carried out with the laser drawing system by which the digital control was carried out, and the relief printing which does not have a joint through processes, such as publicly known exposure, development (washing), desiccation, and a postexposure, is obtained. However, it is hard to say that there is no join thoroughly, and the discontinuous nature of the printed matter in a joint often poses a problem. Establishment of the new plate making process replaced with a wet process like a development (washing) process performed conventionally from viewpoints, such as improvement in platemaking work nature and consideration of work environment, is expected.

[0007]Therefore, in the manufacturing installation using the liquid photosensitive resin which can manufacture the sleeve body which does not have a joint thoroughly, It is efficient for a short period of time, and the demand to realization of the seamless sleeve printing plate manufacturing system which forms a relief image by the technique of laser direct sculpture without the above-mentioned wet process is increasing in the plate making process carried out further after that. In order to meet this demand, for example by JP,2001-179928,A. The platemaking system which can attain rationalization and resource saving is provided by making a cylinder peripheral face carry out image formation to fixed thickness from digital image data directly to supply and the full-hardized photosensitive resin layer.

[0008]However, since it was the process which the application process which supplies the liquid photosensitive resin of the fixed thickness to a cylinder peripheral face, and the full-hard-izing type exposure process by the exposure of active light became independent of in this platemaking system, it was difficult to obtain desired cylinder deviation from circular form by generating of spreading spots etc.

[0009]

[Problem(s) to be Solved by the Invention]This invention is made paying attention to various problems in such conventional technology. Let it be a technical problem to acquire easily the seamless sleeve object of high precision molding thickness, and to make easy manufacture of the seamless sleeve object for printing in which the relief image formation by the laser direct sculpture which is the dry type technique further is possible using liquid photosensitive resin.

[0010]

[Means for Solving the Problem]In a manufacturing method of a seamless sleeve object for printing used as a photosensitive resin printing plate in order that this invention may solve an aforementioned problem, (1) An application process which carries out specified quantity supply of the liquid photosensitive resin in a cylinder peripheral face which carries out (a) rotation, (b) An exposure process which carries out photo-curing while equalizing coating thickness of the applied liquid photosensitive resin concerned, (c) A tail end process which removes a non-sclerosing solution-like photopolymer which

remains on the seamless sleeve-like resin body surface concerned by which photo-curing was carried out, A manufacturing method of a seamless sleeve object for printing which is a manufacturing method of a seamless sleeve object for printing which changes more, and is characterized by dividing said exposure process (b) into at least 2 times or more, and carrying it out.

[0011](2) a manufacturing method of a seamless sleeve object for printing equalizing coating thickness with a doctor blade and molding in the shape of a seamless sleeve by exposure by exposure of active light in it, simultaneously a facing position through a cylinder in said exposure process (b).

[0012]A rotary drive for rotating the (3) and (A) cylinder, in order to need the above manufacturing method and to enforce this manufacturing method, (B) A roll control mechanism for controlling revolving speed of a cylinder, and a spreading head for applying liquid photosensitive resin to (C) cylinder peripheral face, And a liquid-photosensitive-resin feed mechanism having a mechanism in which make a cylinder-axis heart longitudinal direction carry out linearity movement, and the spreading head concerned is sold to it, (D) A liquid-photosensitive-resin smoothing mechanism for obtaining desired cylinder deviation from circular form, (E) An exposure mechanism which irradiates smoothed liquid photosensitive resin with ultraviolet rays, and (F) dew Manufacturing installation of a seamless sleeve object for printing possessing a post-processing mechanism to the seamless sleeve-like resin body surface after light.

[0013](4) A manufacturing installation of the seamless sleeve object for printing according to claim 3 having the constant feeding nature from which a liquid-photosensitive-resin feed mechanism (C) becomes constant [the liquefied resin amount of supply per unit time] in a manufacturing installation of the above-mentioned seamless sleeve object for printing.

[0014](5) A manufacturing installation of the seamless sleeve object for printing according to claim 3 or 4 in which a liquid-photosensitive-resin feed mechanism (C) is characterized by supplying and applying liquid photosensitive resin spirally in a cylinder peripheral face.

[0015](6) A manufacturing installation of the seamless sleeve object for printing according to any one of claims 3 to 5, wherein a liquid-photosensitive-resin smoothing mechanism (D) comprises a doctor blade which has a high precision straightness having a resin rich area ball.

[0016](7) A manufacturing installation of the seamless sleeve object for printing according to any one of claims 3 to 6, wherein an exposure mechanism (E) comprises a source of ultraviolet radiation which emits light to the main force in 200-400 nm of wavelength bands.

[0017](8) A manufacturing installation of the seamless sleeve object for printing according to any one of claims 3 to 7, wherein a post-processing mechanism (F) comprises a feed zone and a stripping section of a rolled form nonwoven fabric.

[0018]A manufacturing installation with the above feature is provided and it is considered as said The means for solving a technical problem.

[0019]It is desirable to deal with a cylinder diameter serving as variable at 200-500 mm according to printing needs enough as a rotary drive (A) and a roll control mechanism (B) of a cylinder. It is desirable to have flexibly structure where it can respond, to the above-mentioned change of a cylinder diameter also about a liquid-photosensitive-resin feed

mechanism (C), a liquid-photosensitive-resin smoothing mechanism (D), an exposure mechanism (E), and a post-processing mechanism (F).

[0020]It is desirable to have a control method and structure where it can respond, flexibly as a liquid-photosensitive-resin feed mechanism (C) and a liquid-photosensitive-resin smoothing mechanism (D) for sleeve width to serve as variable at 600-1600 mm according to printing needs.

[0021]

[Embodiment of the Invention]Hereafter, an embodiment of the invention is described, referring to a figure.

[0022]Although this invention is understood by the following explanation and a figure, the embodiment of this invention is not limited to these.

[0023]One embodiment of this invention is started and the outline composition of the device for manufacturing the seamless sleeve object for printing by the photopolymer of thickness uniform on a sleeve is shown in drawing 1 and drawing 2.

[0024]As shown in drawing 1 and drawing 2, this device for manufacturing the seamless sleeve object for printing, Rotation, the rotation for carrying out speed control and the roll control mechanism 110, the liquid-photosensitive-resin feed mechanism 120, the liquid-photosensitive-resin smoothing mechanism 130, the exposure mechanism 140, and the post-processing mechanisms 150, 160, and 170 of liquid photosensitive resin constitute the cylinder 100.

[0025]The peripheral face of the cylinder 100 is equipped with the sleeve shape substrate 101 with which the surface treatment that adhesive strength is reinforced in the photo-curing process of liquid photosensitive resin, or surface treatment was performed, for example, Via the shafts 102 and 103 for cylinder rotation, it is supported by the cylinder bucks 112 and 113 and connects with the motor 111 for cylinder rotation.

[0026]Specified quantity spreading of the photopolymer liquid 10 is carried out by the liquid-photosensitive-resin feed mechanism 120 on the sleeve shape substrate 101 of a cylinder peripheral face from the cylinder 100 upper part by which the roll control was carried out to the low speed and constant speed of about several rpm. It is preferred that it is liquefied resin which has the viscosity of about 500-10000 P in 20 ** as the photopolymer liquid 10 concerned, and it is preferred to have the character which was directly excellent in the sculpture nature by the infrared laser after photo-curing further.

[0027]In the liquid-photosensitive-resin feed mechanism 120, the actuators 122 and 123 which the resin liquid supply head 126 makes a cylinder-axis heart longitudinal direction (x direction) carry out linearity movement, and sells to it in the cylinder upper part, and the motor for driving 121 of those possess. The photopolymer liquid 10 will be spirally supplied and applied by the operation under specified quantity spreading, i.e., linearity movement of the cylinder-axis heart longitudinal direction of the resin liquid supply head 126, to a cylinder peripheral face as a result. As for the resin liquid supply head 126, it is desirable that it is movable by the cylinder-axis heart direction-crossing-at-a-right-angle (y direction) movable shaft 124 because of desorption facilitating of the cylinder 100 and fine adjustment facilitating of a resin liquid supplying position. In order to respond to the path of the cylinder 100 serving as variable at 200-500 mm, i.e., the relative position of the cylinder surface seen from the resin liquid supply head 126 serves as variable, it is desirable for the resin liquid supply head 126 to be movable by the perpendicular direction (direction of z) movable shaft 125. It is important that the roll control of a

cylinder, the shape of resin liquid supply head 126 tip part, movement speed control of the actuators 122 and 123, etc. are precisely calculated not to mention fixed-quantity adequate supply of resin liquid for the prevention from cellular mixing at the time of the resin liquid supply to a cylinder peripheral face. Since the application process of the photopolymer liquid 10 by the liquid-photosensitive-resin feed mechanism 120 is a process of whenever [only], it needs to supply and apply only the quantity with which it can fully be satisfied of the last molding thickness.

[0028]After specified quantity supply of the photopolymer liquid 10 is carried out in the cylinder peripheral face where it was equipped with the sleeve shape substrate 101, desired cylinder deviation from circular form is obtained with the smoothing mechanism 130. The doctor blade 134 which has a resin receptacle function in which the excess resin liquid scratched by smoothing stagnates in the smoothing mechanism 130, The shutter 135 which intercepts a resin receptacle and a smoothed sleeve surface at the time of the end of smoothing is provided, these are united, and it is supported by the doctor blade bucks 132 and 133. It is possible for the cylinder-axis heart direction-crossing-at-a-right-angle (y direction) movable base 136 to have become movable, and to control precisely the gap (it is hereafter called a smoothing gap) of a cylinder surface and the blade surface of the doctor blade 134 by the motor 131 for doctor blade movement. As for the blade surface of the doctor blade 134, it is preferred to have a high precision straightness of 30 micrometers or less, and this influences greatly the deviation from circular form of the manufactured seamless sleeve object for printing.

[0029]Smoothing of the fixed-quantity-coating finishing resin liquid surface which uses the smoothing mechanism 130, and photo-curing by the exposure mechanism 140 mentioned later are carried out twice [at least] or more simultaneously. For example, when the last molding thickness is 3 mm, first according to the liquid-photosensitive-resin feed mechanism 120. After carrying out fixed quantity coating of the photopolymer liquid 10 of sufficient quantity to obtain a molding thickness of 3 mm on the sleeve shape substrate 101 of a cylinder peripheral face, a smoothing gap is set to 1 mm and smoothing and exposure are carried out. After fully exposing, by extending a smoothing gap to 2 mm and holding this, the photopolymer liquid which was stagnating on the doctor blade 134 is re-supplied to the exposed resin surface, and, moreover, smoothing and exposure are continued. Thus, manufacture of a seamless sleeve object with good molding thickness accuracy is attained by carrying out smoothing and exposure, extending a smoothing gap gradually.

[0030]Although the long arc light which has the long luminescence length equivalent to the maximum width of the cylinders 100, such as a metal halide lamp or a chemical lamp, is generally used for the exposure mechanism 140 and the source 141 of ultraviolet radiation which emits light to the main force in 200-400 nm of wavelength bands is used for it. It is preferred to choose what emits light in an efficient wavelength band according to the sensitivity of the photosensitizer added by the photopolymer liquid 10. If the source 141 of ultraviolet radiation is a high-output lamp, in order to prevent atmosphere and the temperature up of the photopolymer liquid 10, it is preferred to provide cooler styles, such as a heat absorbing filter or an air-cooling mechanism. Since exposure is carried out simultaneously with smoothing of the fixed-quantity-coating finishing resin liquid surface by the smoothing mechanism 130, it is preferred that it is photopolymer liquid which is stagnating on the doctor blade 134 with the light source box 142 that the

ultraviolet radiation 20 is not irradiated. In order to correspond to variable [of a cylinder diameter], it is desirable that it is movable by the cylinder-axis heart direction-crossing-at-a-right-angle (y direction) movable base 143.

[0031]After the seamless sleeve object of desired molding thickness is molded, exposure is completed and the exposure mechanism 140 retreats to the position in readiness distant from the sleeve body surface. The shutter 135 is closed and, simultaneously with it, the smoothing mechanism 130 also retreats to a position in readiness. Since it is in contact with the seamless sleeve body surface whose photopolymer liquid which stagnated on the doctor blade 134 just before that has molded, in the molded seamless sleeve body surface, liquid photosensitive resin will remain as a result. In order to remove the residual liquid-like photopolymer concerned, molding post-processing is carried out with the post-processing mechanisms 150, 160, and 170 using the absorption phenomenon by a nonwoven fabric. The shafts 172 and 173 for molding post-processing approach a molded seamless sleeve body surface, perform adsorption treatment of whenever [only] with the nonwoven fabric 171 supplied from the nonwoven fabric supply roll 151, and collect these molding post-processing the whole used nonwoven fabric to the nonwoven fabric recovering rolls 161. The first purpose of molding post-processing is to carry out adsorption treatment of the doctor blade marks (local residue of a non-sclerosing solution-like photopolymer) and other residual liquid-like photopolymers which remain the moment the smoothing mechanism 130 retreated to the position in readiness.

[0032]In a figure, 152 and 153 are the shafts for nonwoven fabric supply rolls, and 154 is a nonwoven fabric supply-roll control device. 162 and 163 are the shafts for nonwoven fabric recovering rolls, and 164 is a nonwoven fabric recovering-rolls control device.

[0033]As an alternative component, it is preferred the cylinder directly under resin receptacle 201 provided in the bed 200, the doctor blade directly under resin receptacle 202, the recovery resin tank 300, and that the piping 301 and 302 for resin recovery possesses.

[0034]The photo-curing finishing resin layer of uniform thickness can be molded in this way, and the seamless sleeve object for printing is acquired by escaping from the sleeve shape substrate 101 from the cylinder 100. The relief image formation by the laser direct sculpture which is the dry type technique is possible for the seamless sleeve object for printing in which the liquid photosensitive resin 10 was manufactured by the reason and one embodiment of this invention for which the resin which excelled in the sculpture nature by the infrared laser after photo-curing directly preferably is used simple.

[0035]

[Effect of the Invention]After carrying out specified quantity spreading of the liquid photosensitive resin in a cylinder peripheral face according to the manufacturing method of the seamless sleeve object for printing of this invention, The smoothing process by a doctor blade and the exposure process by active light are carried out simultaneously, and the seamless sleeve object of high precision molding thickness is easily acquired by dividing these molding process into at least 2 times or more of multiple times. Since the resin which was directly excellent in the sculpture nature by infrared laser as liquid photosensitive resin is used preferably, after the negative film and carbon black layer which are conventional technology presuppose that it is unnecessary and the development (washing) process from the former which is the wet technique is also unnecessary, relief image formation is possible.

[0036]According to the device of this invention, this method can carry out easily.

CLAIMS

[Claim(s)]

[Claim 1](a) An application process which carries out specified quantity supply of the liquid photosensitive resin in a cylinder peripheral face to rotate, (b) An exposure process which carries out photo-curing while equalizing coating thickness of the applied liquid photosensitive resin concerned, (c) A tail end process which removes a non-sclerosing solution-like photopolymer which remains on the seamless sleeve-like resin body surface concerned by which photo-curing was carried out, A manufacturing method of a seamless sleeve object for printing which is a manufacturing method of a seamless sleeve object for printing which changes more, and is characterized by dividing said exposure process (b) into at least 2 times or more, and carrying it out.

[Claim 2]In a facing position which equalized coating thickness with a doctor blade and passed a cylinder in said exposure process (b) simultaneously with it, A manufacturing method of the seamless sleeve object for printing according to claim 1 molding in the shape of a seamless sleeve by exposure by exposure of active light.

[Claim 3]A manufacturing installation of a seamless sleeve object for printing characterized by comprising the following.

(A) A rotary drive for rotating a cylinder.

(B) A roll control mechanism for controlling revolving speed of a cylinder.

(C) A liquid-photosensitive-resin feed mechanism having a mechanism in which make a cylinder-axis heart longitudinal direction carry out linearity movement, and a spreading head and the spreading head concerned for applying liquid photosensitive resin to a cylinder peripheral face are sold to it.

(D) A liquid-photosensitive-resin smoothing mechanism for obtaining desired cylinder deviation from circular form, an exposure mechanism which irradiates with ultraviolet rays liquid photosensitive resin by which (E) smoothing was carried out, and a post-processing mechanism to the seamless sleeve-like resin body surface after (F) exposure.

[Claim 4]A manufacturing installation of the seamless sleeve object for printing according to claim 3 in which a liquid-photosensitive-resin feed mechanism (C) is characterized by having the constant feeding nature which becomes constant [the liquefied resin amount of supply per unit time].

[Claim 5]A manufacturing installation of the seamless sleeve object for printing according to claim 3 or 4 in which a liquid-photosensitive-resin feed mechanism (C) is characterized by supplying and applying liquid photosensitive resin spirally in a cylinder peripheral face.

[Claim 6]A manufacturing installation of the seamless sleeve object for printing according to any one of claims 3 to 5, wherein a liquid-photosensitive-resin smoothing mechanism (D) comprises a doctor blade which has a high precision straightness having a resin rich area ball.

[Claim 7]A manufacturing installation of the seamless sleeve object for printing according to any one of claims 3 to 6, wherein an exposure mechanism (E) comprises a source of ultraviolet radiation which emits light to the main force in 200-400 nm of wavelength bands.

[Claim 8]A manufacturing installation of the seamless sleeve object for printing according to any one of claims 3 to 7, wherein a post-processing mechanism (F) comprises a feed zone and a stripping section of a rolled form nonwoven fabric.

[Translation done.]